

Assignment 03

Problem 1

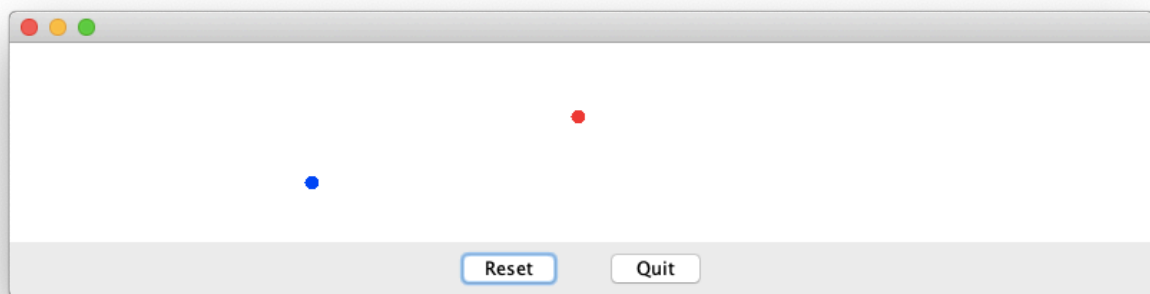
Convert all things to international system of units (SI) at first:

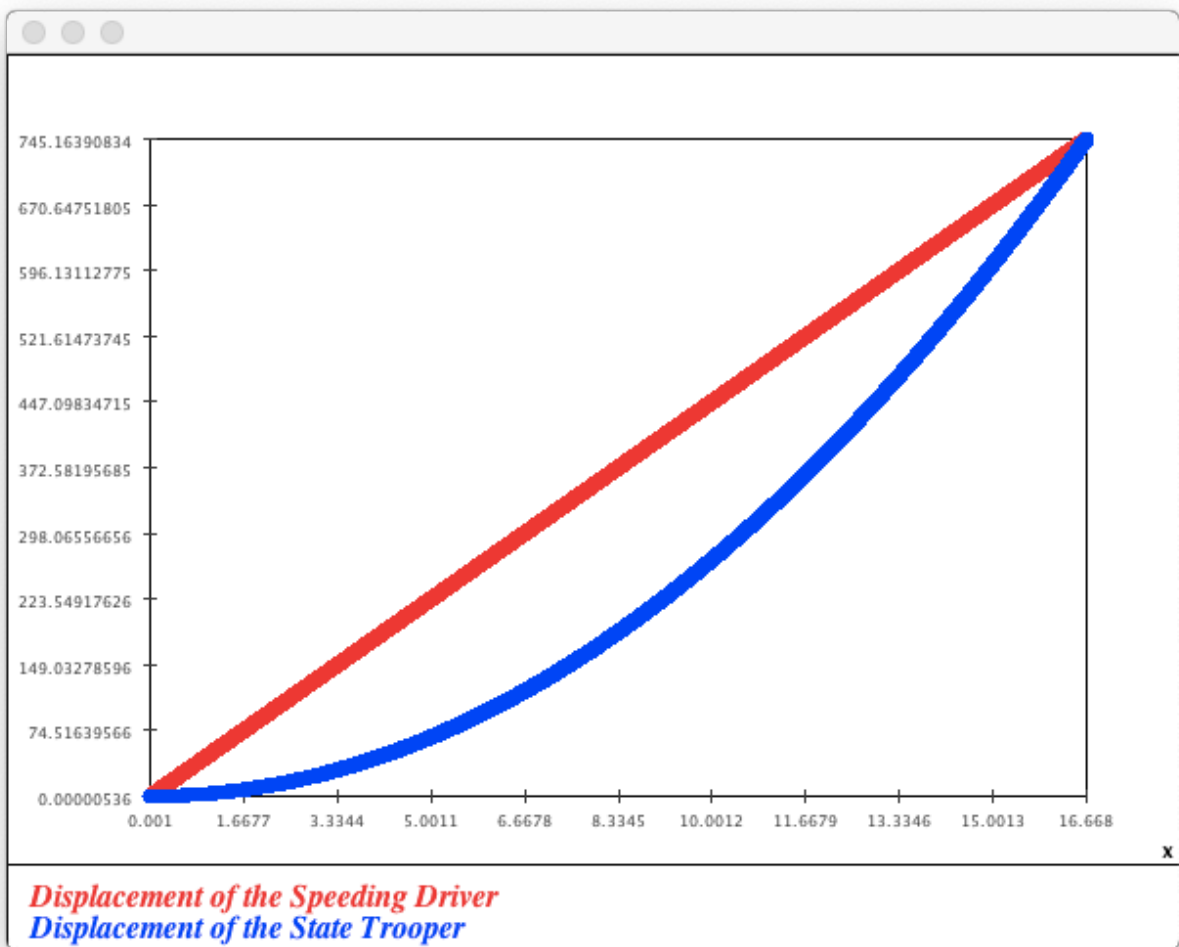
- $100 \text{ mile/hour} = 44.704 \text{ m/s}$
- $12 \text{ mile/hour/s} = 5.364 \text{ m/s}^2$

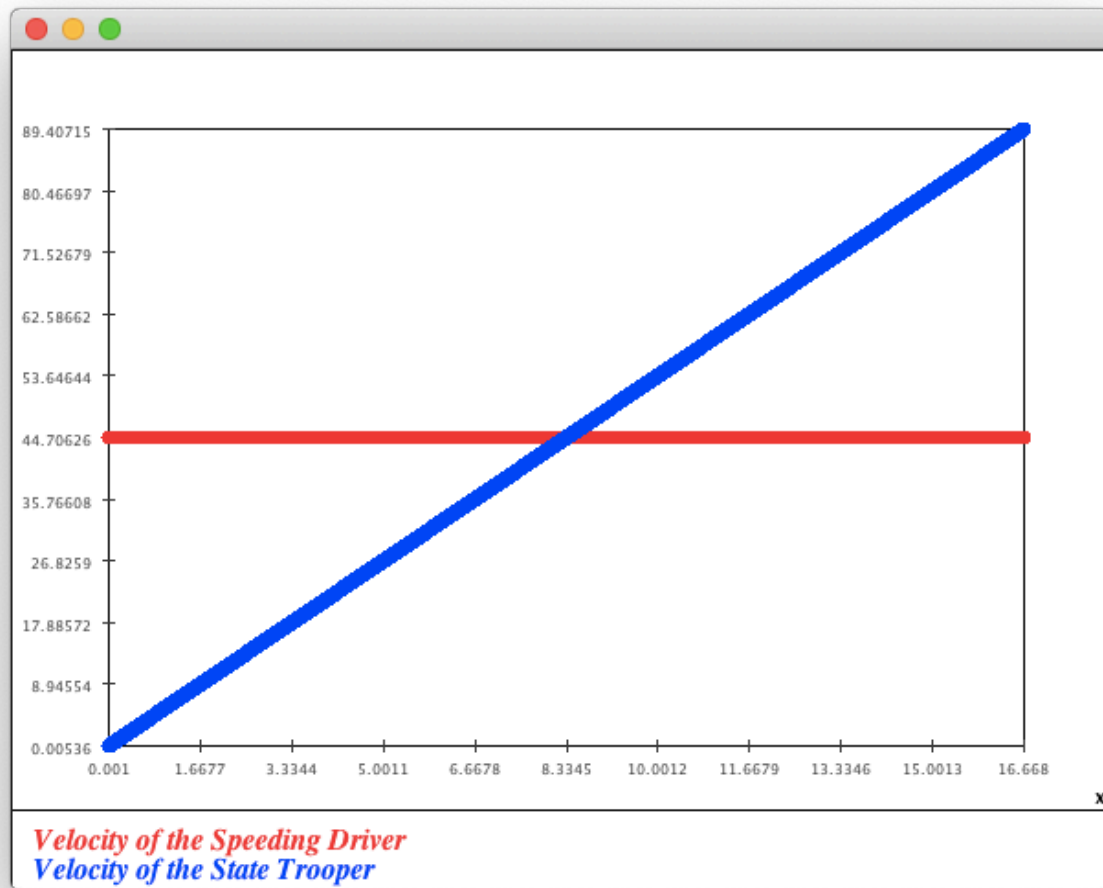
Write codes in file `Problem1.java`.

Result:

- Use international system of units, 1px on screen represents 1 m .
- Red things represents the speeding driver.
- Blue things represents the state trooper.







Conclusion:

- The displacement when trooper catches the driver is about 745.163 *m* (0.463 *mile*).
- The velocity of the trooper at this time is about 89.407 *m/s* (200.001 *mile/hour*), which is twice as the velocity of the driver.

Problem 2

Convert all things to international system of units (SI) at first:

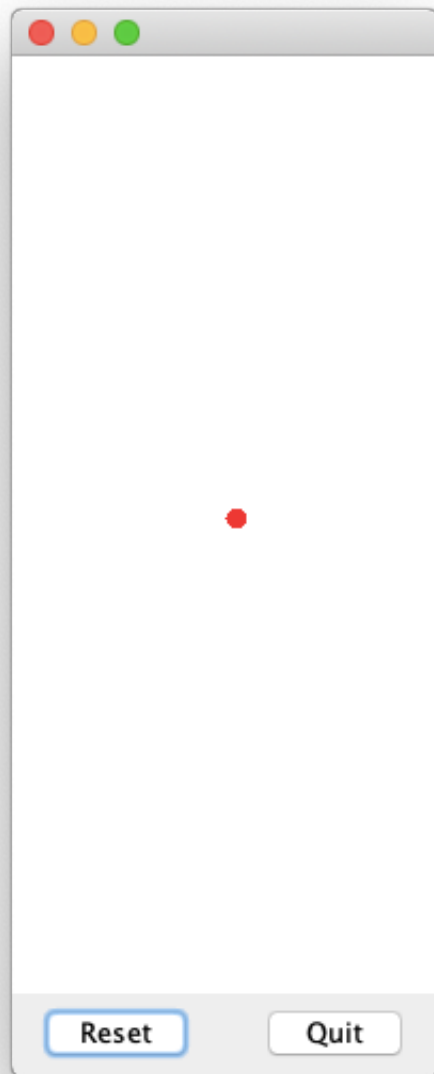
- 1200 *feet* = 365.760 *m*
- 40 *inch/sec* = 12.192 *m/s*

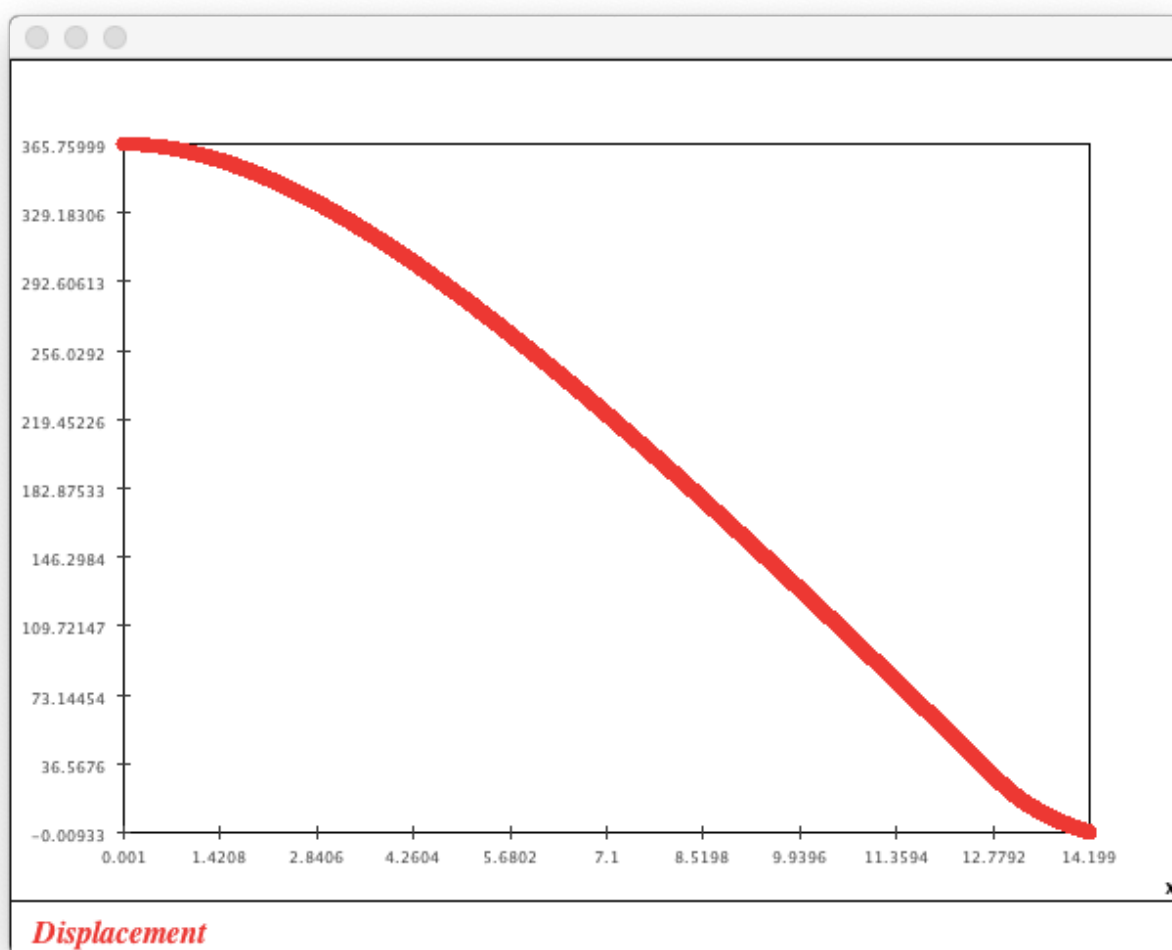
Write codes in file `Problem2.java`.

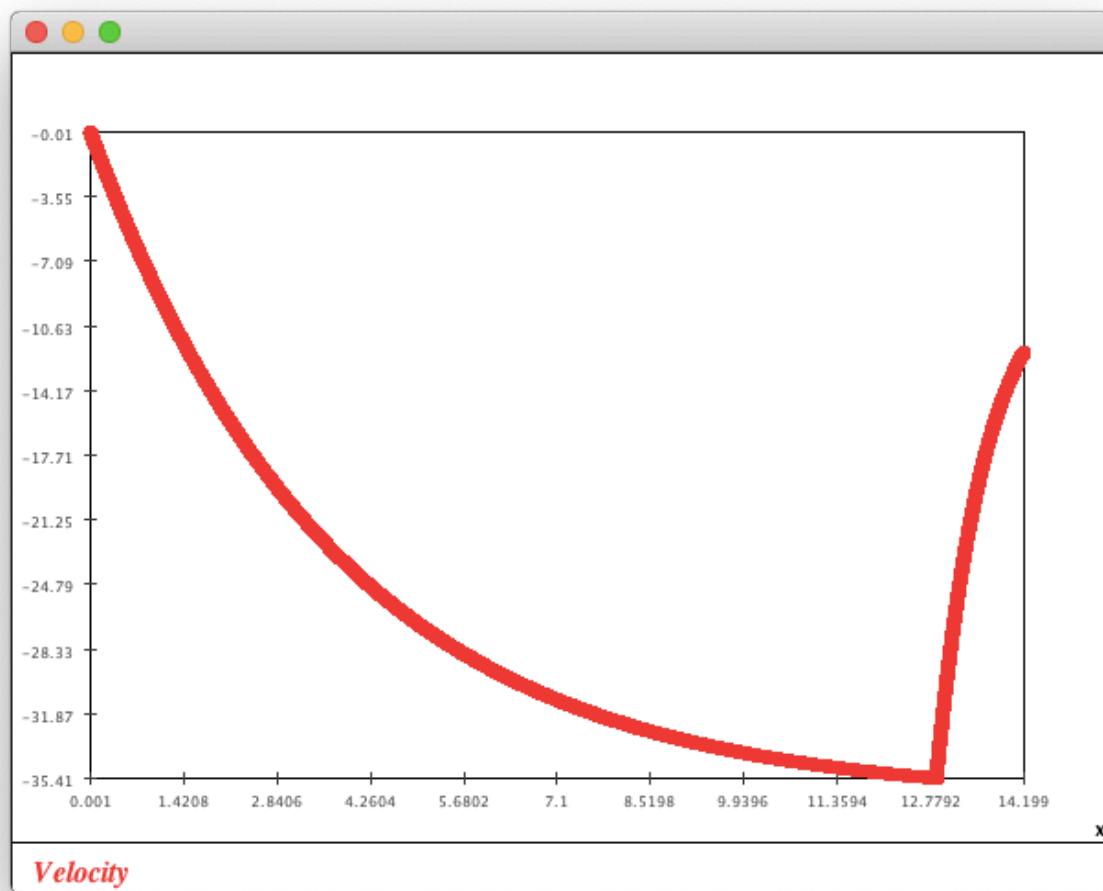
After running several time, choose `T = 12.875` to fit the constraint.

Result:

- Use international system of units, 1px on screen represents 1 *m*.
- Set positive direction as UP.







Finally:

$a = 6.381776797156977 \text{ m/s}^2$

$v = -12.05157410782056 \text{ m/s}$

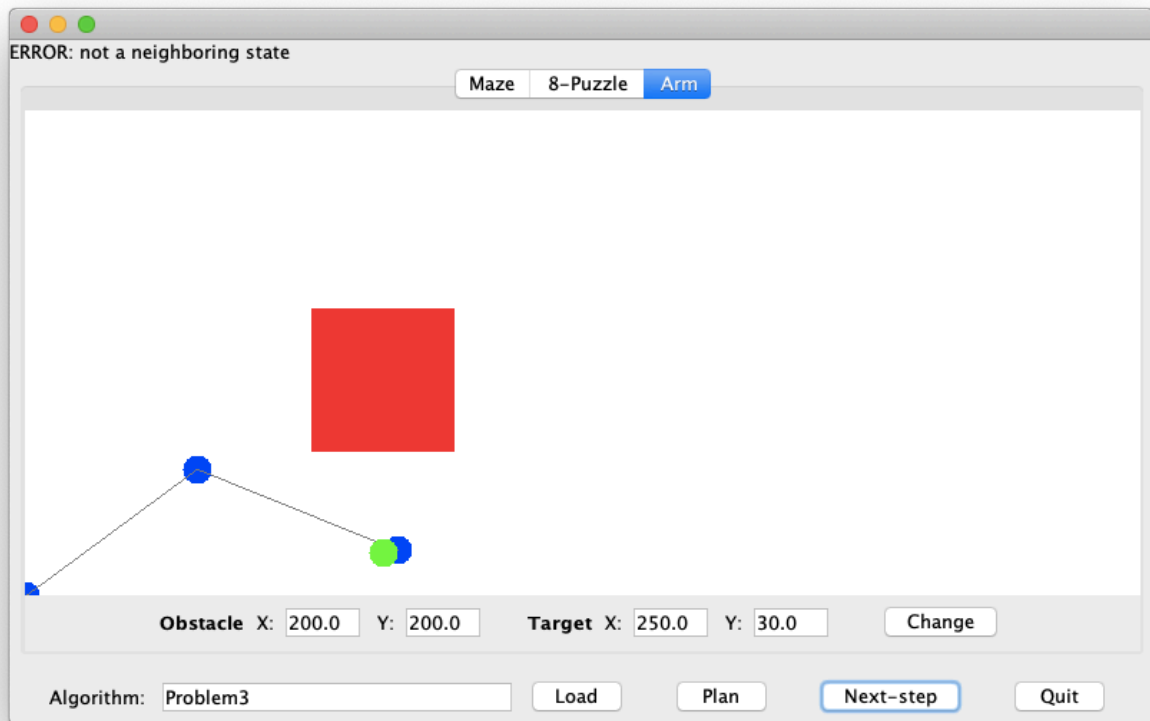
$d = -0.009327123869047016 \text{ m}$

It shows that the chute should be opened no later than 12.875 s.

Problem 3

See file `Problem3.java`.

Result:



Starting plan generation ...

< Pre-plan start. >

pre-plan 1: [140.0, 30.0]

After 100: |F|=24 |V|=100

After 200: |F|=31 |V|=200

After 300: |F|=40 |V|=300

After 400: |F|=48 |V|=400

After 500: |F|=55 |V|=500

After 600: |F|=59 |V|=600

After 700: |F|=57 |V|=700

After 800: |F|=55 |V|=800

After 900: |F|=54 |V|=900

After 1000: |F|=36 |V|=1000

After 1100: |F|=30 |V|=1100

After 1200: |F|=100 |V|=1200

Cost: Solution of length=88 found with cost=435.0 after 1201 moves

pre-plan 2: [180.0, 30.0]

After 100: |F|=24 |V|=100

After 200: |F|=38 |V|=200

After 300: |F|=45 |V|=300

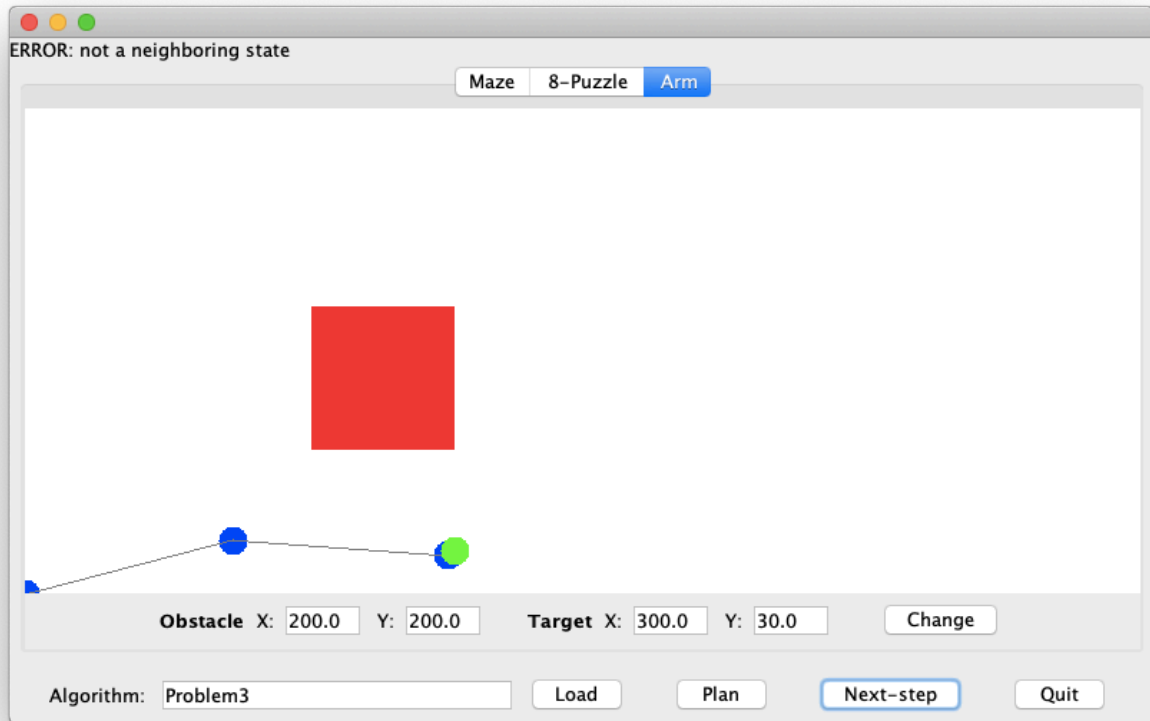
After 400: |F|=53 |V|=400

After 500: |F|=60 |V|=500

After 600: |F|=60 |V|=600

After 700: |F|=57 |V|=700
After 800: |F|=57 |V|=800
After 900: |F|=45 |V|=900
After 1000: |F|=35 |V|=1000
After 1100: |F|=98 |V|=1100
Cost: Solution of length=88 found with cost=435.0 after 1124 moves
pre-plan 3: [220.0, 30.0]
After 100: |F|=28 |V|=100
After 200: |F|=39 |V|=200
After 300: |F|=51 |V|=300
After 400: |F|=60 |V|=400
After 500: |F|=60 |V|=500
After 600: |F|=59 |V|=600
After 700: |F|=57 |V|=700
After 800: |F|=59 |V|=800
After 900: |F|=41 |V|=900
After 1000: |F|=36 |V|=1000
After 1100: |F|=105 |V|=1100
Cost: Solution of length=88 found with cost=435.0 after 1121 moves
pre-plan 4: [260.0, 30.0]
After 100: |F|=32 |V|=100
After 200: |F|=45 |V|=200
After 300: |F|=60 |V|=300
After 400: |F|=61 |V|=400
After 500: |F|=60 |V|=500
After 600: |F|=59 |V|=600
After 700: |F|=60 |V|=700
After 800: |F|=46 |V|=800
After 900: |F|=42 |V|=900
After 1000: |F|=36 |V|=1000
After 1100: |F|=104 |V|=1100
Cost: Solution of length=88 found with cost=435.0 after 1167 moves
pre-plan 5: [300.0, 30.0]
After 100: |F|=34 |V|=100
After 200: |F|=49 |V|=200
After 300: |F|=61 |V|=300
After 400: |F|=61 |V|=400
After 500: |F|=61 |V|=500
After 600: |F|=61 |V|=600
After 700: |F|=61 |V|=700
After 800: |F|=47 |V|=800
After 900: |F|=42 |V|=900
After 1000: |F|=37 |V|=1000
After 1100: |F|=102 |V|=1100
After 1200: |F|=91 |V|=1200
Cost: Solution of length=94 found with cost=465.0 after 1249 moves


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< Pre-plan complete. >
< Plan start. >
Use pre-plan 4.
Cost: Solution of length=89 found with cost=440.0 after 1 moves
Cost: Solution of length=177 found with cost=440.0
< Plan complete. >
```



```
Starting plan generation ...
< Plan start. >
Use pre-plan 5.
Cost: Solution of length=94 found with cost=465.0 after 0 moves
Cost: Solution of length=188 found with cost=465.0
< Plan complete. >
```

It seems that pre-A* will cost less time when "close enough".

The solution provided by pre-A* does not guarantee to be optimal.